

LIPOGRAMMA FLAVESCENS, A NEW GRAMMID FISH FROM
THE BAHAMA ISLANDS, WITH DESCRIPTIVE AND
DISTRIBUTIONAL NOTES ON *L. EVIDES*
AND *L. ANABANTOIDES*

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ABSTRACT

Since 1981, deep reef ichthyofaunal observations and collections have been made by the JOHNSON-SEA-LINK submersibles in the Bahama Islands at depths between 300 and 600 m. A new grammid fish species, *Lipogramma flavescens*, is described from a single specimen collected at a depth of 285 m at San Salvador. In addition, large adult specimens of *L. evides* are described from specimens collected between 108 and 306 m at San Salvador. The first continental record of *L. anabantoides* is documented for the continental shelf north of the Dry Tortugas.

Tropical deep reef ichthyofaunas extending to depths of 300 m or more have only recently been observed in situ (Colin, 1974; 1976) via the submersibles NEKTON GAMMA and ALVIN. Most ichthyological data from these habitats has been limited to observations with few collections of the organisms photographed and otherwise recorded. Verification of identifications with voucher specimens was frequently impossible. The recent development of rotenone ejection systems and fish capture techniques has allowed the collection of many species observed from the JOHNSON-SEA-LINK submersibles (Gilmore et al., 1981). In addition "state-of-the-art" submersible color video systems with remote zoom capabilities in coordination with 35 mm still photography have allowed the identification of many species.

The deep reef formations of the Bahama Islands were examined from 1977 to 1983 by the authors and Dr. C. Richard Robins of the University of Miami through 38 submersible dives conducted by the Harbor Branch Foundation's JOHNSON-SEA-LINK submersibles. Most dives were made to depths of 300 m to determine the distribution, zonation patterns and substrate associations of the Bahamian "wall" ichthyofauna from depths of 20 to 300 m, although deeper dives were made to 600 m¹. Dives to 300 m were made from West End, Grand Bahama Island, Abaco, Black Rock, Berry Islands, New Providence, Tartar Bank and most intensively around the island of San Salvador. The occasional excursions to depths of 600 m were only made at San Salvador and New Providence. Fish collections from the submersible were made only at San Salvador and New Providence. At San Salvador a single specimen of an undescribed *Lipogramma* was collected. Many collections and observations of *L. evides* were also made at San Salvador between depths of 108 to 306 m. An interdisciplinary study of submerged geological formations and flora during the Bahamian expeditions aided in substrate association determinations at San Salvador.

In 1981, dredge collections made north of the Dry Tortugas by Continental Shelf Associates under contract with the Bureau of Land Management captured the first continental record of *L. anabantoides*.

¹ Gilmore, R. G., R. S. Jones and C. R. Robins. In preparation. Depth zonation and habitat preference in Bahamian deep-reef ichthyofaunas.

The purpose of this paper is to describe a new *Lipogramma*, produce additional notes and descriptions of *L. evides* and present the first record of *L. anabantoides* from the continental United States.

The methodologies utilized in the descriptions presented follow Hubbs and Lagler (1947).

The following abbreviations are used in the lists of materials examined: ANSP = Academy of Natural Science, Philadelphia; IRCZM = Indian River Coastal Zone Museum; UF = Florida State Museum; UMML = Rosenstiel School of Marine and Atmospheric Science, University of Miami; FMNH = Field Museum of Natural History, Chicago.

Lipogramma flavescens new species
yellow basslet

Figures 1, 2, Tables 1, 2

Holotype.—USNM 276559, 24.9 mm SL; 0.74 km west of Low Cay, French Bay, San Salvador, Bahama Islands; 23°36.3'N, 74°29.4'W; 285 m; rotenone and "critter gitter"; 18 Oct. 1982; R/V JOHNSON cruise J-148(II), JOHNSON-SEA-LINK 1 submersible dive 1291, R. S. Jones and R. Cook.

Diagnosis.—Dorsal rays XII-9, last ray composite; anal rays III-8, last ray composite; pectoral rays 16; pelvic rays I-5, first segmented ray elongate, extending past base of last anal ray, (61% of SL); segmented caudal rays 19 (III-19-III); vertebrae 25 (10 + 15); total gill rakers 15 (3 + 12); branchiostegals 6 (4 + 2); no lateral line canal on body; maxilla naked; 20 lateral scale rows. Body bright lemon to canary yellow, black vertical bar through orbit, black spot at base of soft dorsal (last five rays) extending onto back; black margin along distal edge of anal fin below intense yellow band; well defined yellow spots on fin membranes of pelvic and lower two thirds of anal.

Description.—Counts and measurements of the single type specimen collected are given in Table 1.

Spinous and soft dorsals are confluent, spines 8 through 10 are longest, last two rays extend beyond base of caudal. All dorsal soft rays are branched as are anal and all but one of the pectoral rays. Caudal is rounded with three spines and one unbranched ray above and below seventeen branched caudal rays which are based on the terminal hypurals. Sixth anal ray extends past caudal base. Membrane of pelvic extends one-half length of 1st ray which extends beyond base of last anal ray. Pectoral fin extends past origin of anal fin.

Proportional measurements reveal a shallow maximum body depth, and abbreviated snout and head, when compared to other described species of *Lipogramma* (Table 1 and 2).

Upper jaw dentition consists of a row of 11 enlarged canines divided asymmetrically across the symphysis (i.e., 4 + 7) and anterior to 3 to 5 rows of smaller secondary teeth. All teeth are conical and form a biserial row laterally becoming uniserial as they extend onto the posterior premaxillary margin past the gape (Fig. 2A). Uneven distribution of upper anterior canines may be due to tooth loss although this is not apparent. The largest anterior canines are the most lateral, reducing in size toward the symphysis. Lower jaw with 10 enlarged canines divided symmetrically on either side of the symphysis (5 + 5) and anterior to a biserial row of smaller teeth which become uniserial posterolaterally. Palatines and vomer with single tooth row.

Lateral line is absent. Head pore system consists of four pores in the supraorbital (ocular) canal, two anterior-most pores adjacent to nostrils, with single interocular

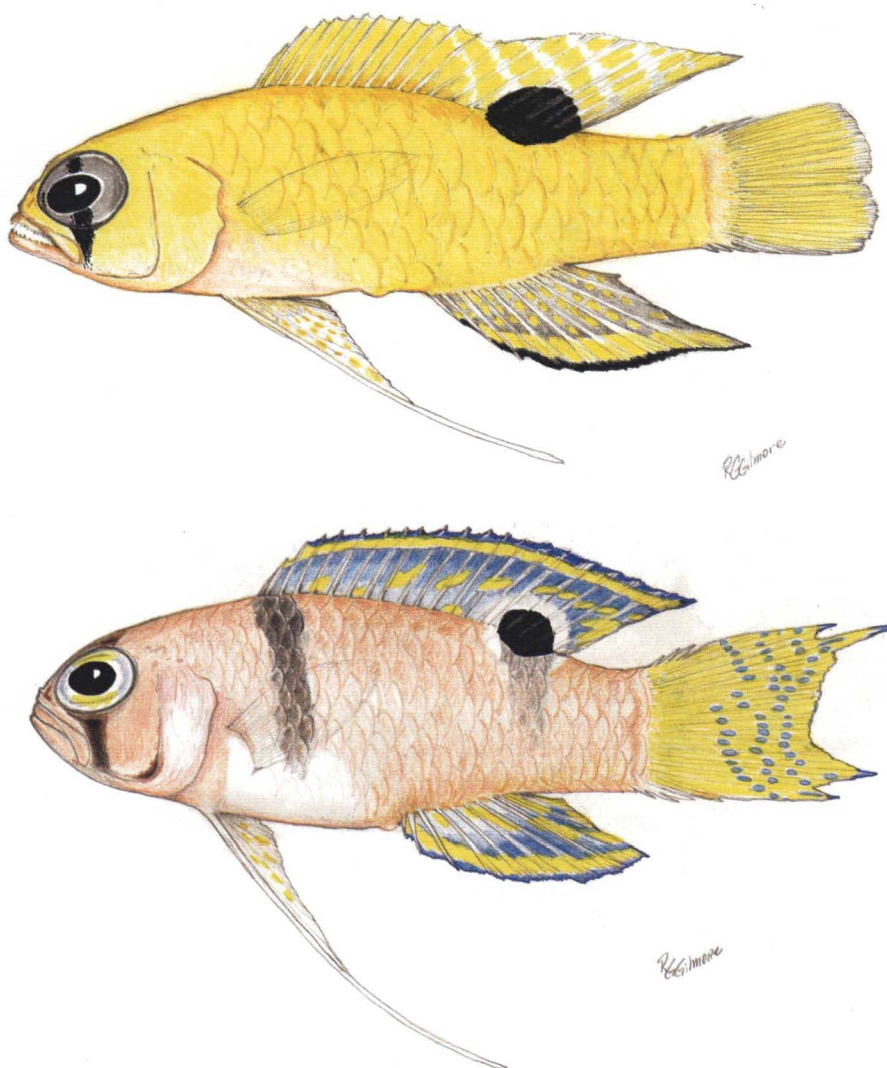


Figure 1. (Upper) *Lipogramma flavescens*, holotype, USNM 276559, 24.9 mm SL. (Lower) *Lipogramma evides*, pigmentation pattern of largest adult specimen captured (45.3 mm SL), USNM 276560.

pore between junction of preopercular canal and infraorbital connection. A single supratemporal pore occurs dorso-anterior to two preopercular pores. There are nine pores in the preopercular-mandibular canal series. Two pores occur at either end of the isolated suborbital canal. This pattern most closely resembles that of *L. roseum*² and *L. regium*² (Robins and Colin, 1979).

Scales are large, deciduous, and ctenoid; there are 20 lateral rows from shoulder

² Spelling of the *Lipogramma* species presented here have been changed due to the recognition that the genus *Lipogramma* is neuter. Therefore, *Lipogramma rosea* = *L. roseum*, *L. regia* = *L. regium* and *L. trilineata* = *L. trilineatum*. (These gender changes have been made in this text based on recommendations made by Dr. C. Richard Robins.)

Table 1. Meristic and morphometric measurements of *Lipogramma flavescens*, holotype, USNM 276559

Morphometry		Meristics	
Standard length (mm)	24.9	Dorsal fin	XII-9
Total length (mm)	32.5	Anal fin	III-8
Head length (% SL)	34.9	Pectoral	16/16
Maximum body depth	30.7	Pelvic	I-5
Orbit width	12.1	Caudal	III-2-17-2-III
Interorbit	4.8	Lateral scale rows	20
Postorbital length	13.7	Oblique scale rows	10
Head width	20.5	Gill rakers	3 + 12 (15)
Mandible length	9.2	Vertebrae	10 + 15 (25)
Upper jaw length	10.4		
Snout length	7.6		
Snout to dorsal origin	40.2		
Snout to pectoral origin	36.2		
Snout to pelvic origin	34.9		
Snout to anal origin	40.2		
Snout to vent	57.0		
Depth of caudal peduncle	16.9		
Dorsal fin length	65.5		
Dorsal base length	43.8		
Anal fin length	45.0		
Anal base length	21.7		
Pectoral fin length	28.1		
Pelvic fin length	57.4		

girdle to caudal base and 10 rows between spinous dorsal- and anal-fin origin. Scales form a sheath around the dorsal- and anal-fin base. Ctenoid scales have strong well developed ctenii in small triangular patches on the posterior scale margin. This differs significantly from *L. evides* specimens examined in which ctenii are not as strong, limited to and well dispersed along the posterior scale margin (Fig. 2, C₁, C₂). Scales extend forward on head to orbits. Scales on cheeks, preopercle, opercle, interopercle and isthmus lack ctenii. Fins are naked.

Margin of the opercle and preopercle are entire.

In life the body coloration is a bright lemon to canary yellow, lighter near the belly (Fig. 1). Spinous dorsal membrane is solid yellow breaking up into diagonal white and yellow bands along the soft dorsal. Ventral third of the last five dorsal rays are covered with black pigment forming a spot extending down onto the body below the soft dorsal base. Caudal is solid yellow except for a clear posterior margin. Proximal two thirds of the anal membrane is clear with distinct yellow spots, below which is a solid yellow band. Distal margin of anal is black. Clear membrane of the pelvic is spotted with yellow. First pelvic ray, which extends beyond the anal base is lustrous white. Pectoral is unpigmented. Orbit, iris and lower cheek are crossed with a black vertical bar.

The yellow pigment gradually fades in alcohol, though is still evident after at least 3 years. The black pigment, bar and dorsal spot remain.

There are 15 total long slender gill rakers (3 + 12) including rudiments. Rakers on the lower arch all have 12 to 20 secondary rakers or pointed teeth along their inner margin (Fig. 2B). These secondary rakers are also found in *L. evides* specimens examined but are not evident on rakers of the 17 mm SL *L. anabantoides* examined.

Etymology.—From Latin for the predominant body coloration, yellow or yellowish.

Table 2. Meristic and morphometric characters of western Atlantic species of the genus *Lipogramma*

Character	<i>regium</i>	<i>klayi</i>	<i>rosam</i>	<i>trilineatum</i>	<i>anabantoides</i>	<i>evides</i>	<i>flavescens</i>
SL range	16.6	22.8-25.4	9.5	19.5-28.0	10.8-16.6	12.6-45.3	24.9
HL*	37-38	34.6-35.8	38	35.4-36.9	40-42	35-40	35
DEPTH*	36	36.8-38.4	32	32.7-33.6	40-41	33-38	31
ORBIT*	13-14	12.6-13.2	11	11.4-13.8	14	13-16	12
SNOUT*	12	7.0-7.2	6.9	8.2-9.1	9-10	5-6	6
P1-LGTH*	22-25	22.7-23.4	18	20.5-23.9	24	25-29	28
P2-LGTH*	41-45	38.6-58.5	?	36.9-69.3	49-52	29+-49	57
Snout to vent*	67				76	58-67	61
D	XII-9	XII-9	XI-6	XII-10	XIII-8	XII-9	XII-9
A	III-8	III-8	III-6	III-7	III-8	III-8	III-8
P1	17	15-16	16	15	17	15-17	16
P2	I-5	I-5	I-5	I-5	I-5	I-5	I-5
C	17	17	17	17	17	17	17
Scale rows	26	36-38	26	29-30	26	23-26	20
Gill rakers	14	19	?	15 (4 + 1 + 10)	12 (3 + 9)	19-21 (6 + 15)	15 (3 + 12)
Vertebrae		10 + 15		10 + 15		10 + 15	10 + 15

* All measurements in percent of standard length.

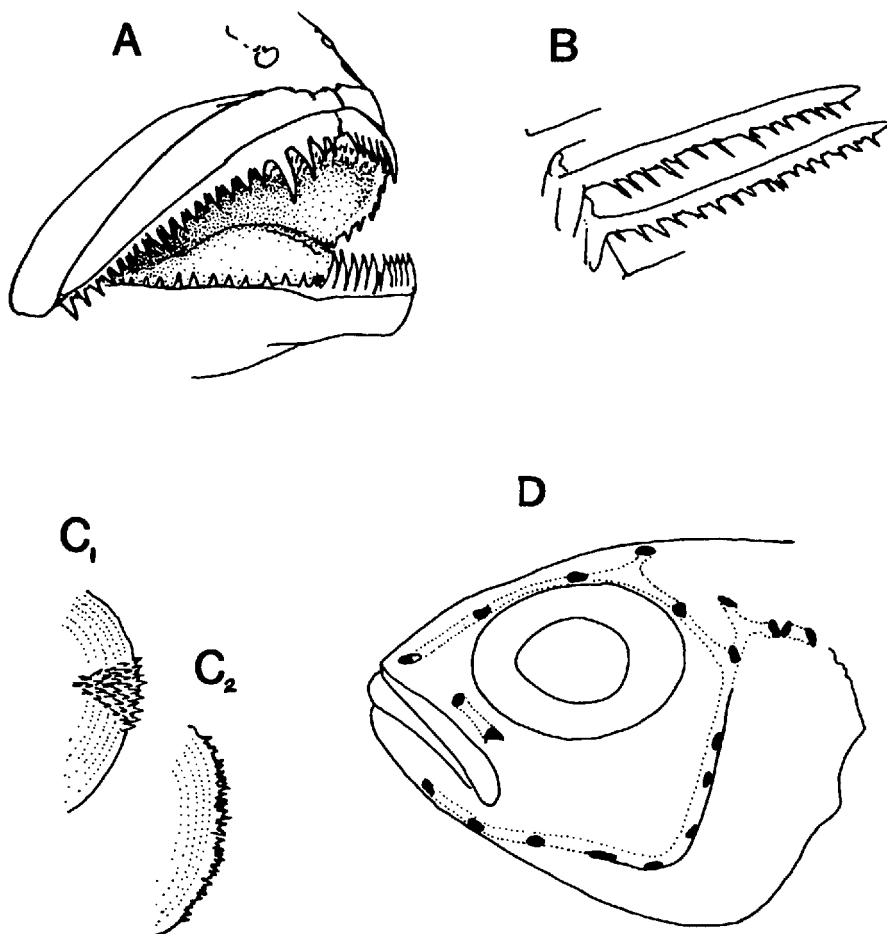


Figure 2. (A) Dentition, (B) gill raker ctenii on first arch, (C₁) ctenoid scale margin of *Lipogramma flavescens* and (C₂) *L. evides* and (D) cephalic pore system of *L. flavescens*, holotype, USNM 276559.

Habitat.—The single specimen was captured among sedimentary boulders strewn over a calcareous rubble and sand bottom. No vegetation or extensive plumose invertebrate growth (e.g., alcyonarians or gorgonians) occur at this depth. The available shelter is within the extensive solution holes formed in the rock substratum. The capture and observation of only a single specimen of this species suggests that it is apparently secretive and limited to the deeper portion of the Bahama wall below 200 m. *L. flavescens* will undoubtedly be discovered at other locations in the tropical western Atlantic, provided the proper techniques are utilized.

Distribution.—Limited to type location. This species will probably be found over a much wider range in the tropical western Atlantic as many syntopic species also range widely, i.e., from Cape Hatteras to South America including the Gulf of Mexico, Bahamas and Antilles, though probably limited to deep reef formations between 150 and 350 m depths.

Relationships.—At present, *L. flavescens* is only known to be sympatric with *L.*

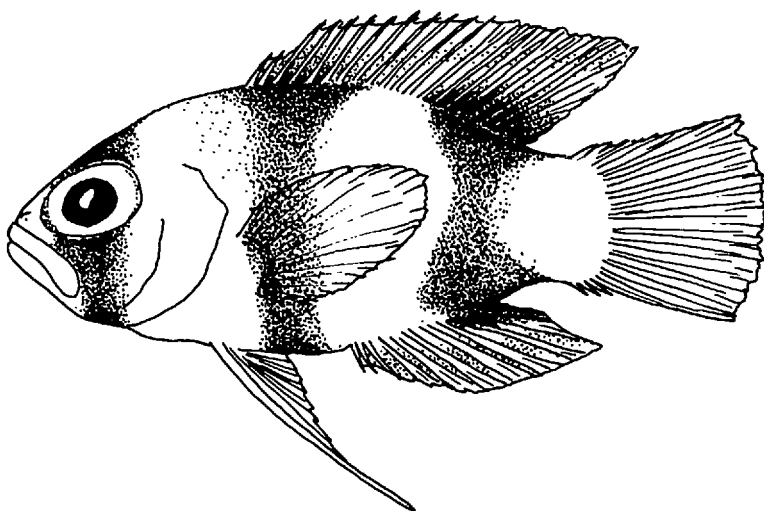


Figure 3. Early juvenile color phase of *Lipogramma evides* (14.1 mm SL), IRCZM 107:07660.

evides from which it can be readily separated based on pigmentation and color pattern. *L. evides* also has a greater proportional body depth, 3 to 6 more lateral scale rows, 3 more upper and 3 more lower gill rakers than *L. flavescens* (Table 2). *L. flavescens* has a slightly longer pelvic fin and slightly smaller orbit than *L. evides*. All other morphometric and meristic characters overlap between these two species and except for their distinctive color pattern, lateral scale rows and gill raker counts, it is likely there will be additional character overlap between these species when a good representative series of *L. flavescens* is eventually captured.

L. flavescens has the largest scales of any of the species within the genus, with 20 rows in the lateral series versus 23 to 38 in other congeners. *L. evides* also has relatively large scales and reaches a larger size than other congeners.

There are two other congeneric species which are partly yellow but can be separated from the yellow basslet by their distinctive markings. *L. trilineatum* has three horizontal blue margined silver stripes on the head originating on the snout, two passing through the orbits and one extending between the orbits to the nape. *L. klayi* has a crimson red head.

Lipogramma evides Robins and Colin
banded basslet
Figure 3, Table 2

Six specimens of this species, 14.1 to 45.3 mm SL, were captured along the east and south shore of San Salvador, Bahama Islands between 16 October 1982 and 1 November 1983. This doubles the number of museum specimens available for study (12 total). However, the few fishes captured do not nearly represent the true abundance of this species particularly between depths of 200 and 300 m. Numerous observations of larger specimens have been made allowing habitat and depth range to be determined. All specimens were captured below a depth of 185 m. A banded *Lipogramma*, thought to be *L. evides*, was observed off Abaco, 24 February 1981 at a depth of 108 m, and constitutes the shallowest observation of this species.

With the capture of additional specimens, color differentiation between ontogenetic stages is now shown to be greater than initially described by Robins and Colin (1979). In specimens smaller than 20 mm SL, there are three intense broad black lateral bands as noted in the original description (Fig. 3). In individuals over 30 mm SL, however, the two posterior lateral bars lack definition; although present, they are faint, narrow, and do not extend to the abdomen. The eye bar is most pronounced and is dark black-brown as in smaller individuals. Above the faint posterior bar a soft dorsal ocellus is particularly well-developed, covering the lower portion of dorsal rays 4–5. In smaller individuals there is no differentiated ocellus, and a broad black lateral bar, which covers the soft dorsal, extends from the length of the soft dorsal base to the posterior four rays of the anal. This developmental pattern is reminiscent of that observed in *Chaetodon capistratus* in which the loss of lateral bars on the body of juveniles is associated with the development of a well defined ocelli in the adult.

In life, the major portion of the body of *L. evides* is flesh colored with yellow, ochre and orange tones. Fin membranes are light blue to ultramarine near distal edges with lemon yellow stripes and spots as noted in the original description. Caudal is lemon yellow with light blue spots forming three loose rows. Tips of extended caudal rays are ultramarine blue.

Habitat.—Our limited observations of heavily banded juveniles indicates that they are found principally in the shallower depth range for the species, i.e., <200 m. The largest specimens, i.e., those over 39 mm SL, have been captured at depths over 250 m at San Salvador. The distribution of the major population of *L. evides* at San Salvador correlates well with a major change in geological and sedimentary substratum (“D-limestone”; Hoskin, pers. comm.) from shallower, more vertical and scalloped limestone formations (“F-limestone”; Hoskin, pers. comm.). The break depth between the “D” and “F” limestone formations is around 185 m. Below 185 m, the slope is more gentle (e.g., 45°, versus 55° to 90°). It is within this zone that most bioclastic sediment raining from above, particularly *Halimeda* rubble, has the opportunity to settle and form shallow deposits. Scalloped limestone cavities and small ledges, so characteristic of the wall above 185 m, are absent. Large, smooth boulders and smooth rock substrate, interspersed between sediment filled furrows, are more conspicuous below 185 m.

Other fish species are also limited to this zone below 185 m. Most plant species extend only to 185 m with some crustose coralline reds extending below this depth. The extent to which *L. evides* occurs below 300 m is not known. The “D” limestone formation extends at least to 610 m. Our single dive to 619 m indicated a distinct faunal change by the time this depth was reached (Gilmore et al., in prep.).

L. evides and apparently *L. flavescens* are found principally in this twilight zone between 185 and 300 m which is the approximate limit for most typical shallow reef taxa (e.g., *Opistognathus* sp., *Gymnothorax moringa*, *Mycteroperca interstitialis*).

This account represents the first Bahamian record for *L. evides*, which is undoubtedly more widely distributed throughout the tropical western Atlantic as Robins and Colin, 1979, have hypothesized.

L. evides reaches a standard length of at least 45.3 mm based on specimens collected to date and, therefore, is the largest known species in the genus.

Material Examined.—Holotype, ANSP 134329, 34.4 mm SL, Arrowsmith Bank, 21°05'N, 86°23'W in 146 to 265 m, 22 May 1967, R/V PILLSBURY sta. 581. Paratypes, ANSP 134330 (2, 28–32 mm SL) collected with the holotype, ANSP 134331 (1, 17.2 mm SL) 17°27.8'N, 61°41.1'W (southwest of

Barbuda) in 68–216 m, 20 July 1969, R/V PILLSBURY sta. 969. ANSP 134332 (1, 12.6 mm SL) Jamaica, Discovery Bay, 15 August 1972, NEKTON GAMMA dive 151, collection 151-2, in 145 m in reef rock brought to surface, L. Land and S. Hastings. ANSP 158091, 35.2 mm SL, San Salvador, Bahama Islands, 24°08.5'N, 74°31.0'W at 310 m, 16 October 1982, R/V JOHNSON cr. 148(II), JOHNSON-SEA-LINK I submersible dive 1289, R. G. Gilmore and T. Askew. USNM 276560, 45.3 mm SL, San Salvador, Bahama Islands, 24°03.5'N, 74°32.5'W, at 302 m, 29 October 1983, R/V JOHNSON cr. 159(IV), JOHNSON-SEA-LINK I submersible dive 1508, R. G. Gilmore and D. Liberatore. UF 100284, 36.6 mm SL, San Salvador, Bahama Islands, 24°06.5'N, 74°32.0'W, at 246 m, 31 October 1983, R/V JOHNSON cr. 159(IV), JOHNSON-SEA-LINK I submersible dive 1512, R. G. Gilmore and D. Liberatore. IRCZM 107:07659, 41.0 mm, SL, San Salvador, Bahama Islands, 24°03.5'N, 74°32.5'W at 251 m, 1 November 1983, R/V JOHNSON cr. 159(IV), JOHNSON-SEA-LINK I submersible dive 1515, C. R. Robins and D. Liberatore. IRCZM 107:07660, 14.1 mm SL, San Salvador, Bahama Islands, 24°03.6'N, 74°32.9'W, at 171 m, 22 October 1983, R/V JOHNSON cr. 159(IV), JOHNSON-SEA-LINK I submersible dive 1499, J. Miller and D. Liberatore.

Lipogramma anabantoides Böhlke

dusky basslet

Table 2

This small species has been recorded from Grand Bahama Island and Haiti. The capture of a 17.0 mm SL specimen on the southwestern Florida shelf at a depth of 67 m represents the first continental record for the species. The single specimen was taken in a dredge sample over live bottom habitat as part of a Bureau of Land Management faunal study of potential oil lease sites. All specimens of this species typically frequent depths less than 67 m.

The specimen was taken at 24°47.5'N, 83°41.2'W at a depth of 67 m on 8 April 1981. This specimen is deposited in the Florida State Museum, Gainesville, Florida.

We recommend dusky basslet as the common name of this species in reference to the uniform light bronze brown color of the body in fresh specimens (C. R. Robins UMMML and C. R. Gilbert UF, pers. comm.).

Material Examined.—UF 100283, 17.0 mm SL, at 67 m, 8 April 1981, 24°47.5'N, 83°41.2'W, R/V BELLOWS cr. II, Sta. 29-TDS-a, Keith Spring. Holotype, ANSP 92412, 15.3 mm SL, 22–23 m, Wood Cay, off Grand Bahama Island, Bahama Islands, 26°44.3'N, 79°02.4'W, sta 510, R. E. Schroeder and S. Gross. Paratype, ANSP 92413, 16.6 mm SL, data as for holotype. IRCZM 107:07661, 19.3 mm SL, at 76 m, 10 November 1983, 11.2 km S.E. of West End, Grand Bahama Island, Bahama Islands, 26°36.5'N, 78°53.5'W, R/V SEA DIVER cr. S-150, JOHNSON-SEA-LINK I submersible dive 780, S. Blair.

DISCUSSION

Lipogramma flavescens and *L. evides* are the only species of *Lipogramma* that have been recorded from depths below 150 m. As only a single specimen of *L. flavescens* has been collected at the deep end of the faunal survey range, i.e., at 285 m, *L. flavescens* may inhabit reef formations below 300 m. This may partially explain its rarity in submersible collections and observations made to date relative to the commonly encountered *L. evides* populations. Until additional specimens are obtained it will be difficult to discuss the taxonomic relationships of *L. flavescens* based on meristic and morphometric characters with any degree of confidence. It might not be fortuitous that the three *Lipogramma* species which may occur in shallow water depths, i.e., <15 m, *L. roseum*, *L. anabantoides* and *L. trilineatum*, have vertical fin element compliments that differ from the four species which are indigenous to depths over 20 m (i.e., *L. flavescens*, *L. evides*, *L. klayi* and *L. regium*), the latter group having the same dorsal and anal count, XII-9, III-8 (Table 2).

Due to the paucity of comparative material at this time a detailed discussion

of phyletic relationships within this genus would be premature, however, we would like to present the following key to aid in species identification. This is basically a revision of the key published by Robins and Colin (1979).

KEY TO THE SPECIES OF LIPOGRAMMA

- 1a. Base of the soft dorsal fin with prominent dark spot or band 2
- 1b. Soft dorsal fin without prominent markings 5
- 2a. Body banded or barred 3
- 2b. Body uniformly pigmented 4
- 3a. Body with three dark bars, most evident in specimens <25 mm SL, 1st through the orbit, 2nd below the origin of the spinous dorsal, becoming less distinct in large specimens as does 3rd bar below the posterior soft dorsal; upper portion of 3rd bar forms an ocellus in adults, which reach 45.3 mm SL
..... *evides* (banded basslet) (Barbuda, Jamaica, Belize, Arrowsmith Bank, Bahama Islands)
- 3b. Body with 4–5 dark cross bars, each pale-centered and thus appearing double; head horizontally striped; pelvic fins dusky, with darker cross bars
..... *regium* (royal basslet) (southwestern Puerto Rico, Bahama Islands)
- 4a. Body dusky brown; pelvic fins dark; spinous dorsal XIII
..... *anabantoides* (dusky basslet) (Florida, Haiti, Bahama Islands)
- 4b. Body solid yellow, except for vertical bar through orbit and dark spot on base of soft dorsal; pelvic fins haline with yellow spots; spinous dorsal XII
..... *flavescens* (yellow basslet) (Bahama Islands)
- 5a. Dorsal spines XII or XIII 6
- 5b. Dorsal spines XI; body rosy throughout, caudal fin yellow with dark spots; a bright yellowish-white line from snout tip toward dorsal-fin origin; dorsal soft rays 6; anal soft rays 6; pectoral rays 16; lateral scale rows 26
..... *roseum* (rosy basslet) (Isla de Providencia in the western Caribbean Sea)
- 6a. Body nearly bicolored, purplish-red anteriorly, yellow posteriorly; no median dark dorsal stripe on head and body, nor stripes from upper eye to fore part of body; 36–38 lateral scale rows
..... *klayi* (bicolor basslet) (Jamaica, Belize, Curaçao, Bahamas)
- 6b. Body basically yellow, head and body with median dark dorsal stripe, second stripe on each side from upper part of eye to fore part of body; 29–30 scale rows
..... *trilineatum* (threeline basslet) (Bahamas, southeastern Florida, eastern Mexico to Curaçao)

ACKNOWLEDGMENTS

This study was supported by skilled personnel in the Harbor Branch Foundation Divisions of Marine Operations and Engineering. Their technical expertise, tool development and submersible operations made possible the observations reported herein. Special thanks should go to the submersible pilots, R. Cook, T. Askew and D. Liberatore, whose dexterity in manipulating a 6,000 kg submersible to capture an elusive 3.0 g *Lipogramma* was superlative. Dr. C. R. Robins participated in the San Salvador R/V JOHNSON cruise 159 (II), October–November 1983 and succeeded in making valuable observations and captures of *L. evides*. Continental Shelf Associates kindly allowed us to examine the specimen of *L. anabantoides* captured under Bureau of Land Management Contract No. 321. Dr. W. Starnes of the United States National Museum of Natural History provided radiographs of all *Lipogramma* specimens examined.

This constitutes Contribution No. 543 to the Harbor Branch Oceanographic Institution, Inc. and University of Texas at Austin Marine Science Institute Contribution No. 678.

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DATE ACCEPTED: September 2, 1987.

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